A Device and Method for Realizing Dynamic Adjustment of Data Bandwidth in a Transmission Device

FIELD OF THE INVENTION

The present invention relates to Ethernet communication technology, and more particularly to a device and method for realizing dynamic adjustment of data bandwidth in a transmission device.

BACKGROUND OF THE INVENTION

Pulse Code Modulation (PCM), as a traditional concept, means multiplexing voice service to E1/T1 by PCM. With its development, particularly for demand for data services, PCM device is enhanced its capability to support service. Now the concept of PCM is limited to multiplexing voice, but can multiple services such as voice, data, image, etc. to E1/T1 on the basis of time slot, as shown in Figure 1. At the beginning multiplexing data and image services is realized through V.35 interface, and the device only simply maps V.35 channel to time slot of E1/ T1. It generally needs outside protocol converter or Router for realizing data service application with V.35 interface. Nowadays, for more conveniently and simply realizing access of data services for users, many PCM equipments can supply 10M Ethernet interface to realize seamless access of user data.

PCM devices have been widely used in telecommunication and special network, such as electric power, water conservancy and public security because of its simply technology, flexible application and reasonable price. However, in networking application with limited bandwidth, especially special net, it is generally required to sufficiently utilize the trunk bandwidth because rental trunk bandwidth is limited. Particularly, when voice and data access mixed, it is required that data services can occupy idle time slots while voice is not activated. However, service bandwidth is generally configured in static state for a PCM device, and the bandwidth of data service is distributed to fixed time slots. Even if voice service is free, data service cannot occupy idle bandwidth. If software is used to reconfigure numbers of time slots for data service by detecting idle time slots, it will result in butting problems with opposite equipments and error codes in data services even service interruption caused by

changing bandwidth.

SUMMARY OF THE INVENTION

The present invention is to solve technical problems for overcoming shortcoming in IP and PSTN videophone of background technology, to provide a method for realizing videophone terminal with transmitting IP address by PSTN and multimedia data information by IP network.

An object of the present invention is to provide a device, which can realize dynamical adjustment bandwidth in a transmission equipment, in order to dynamically adjust Ethernet data bandwidth and effectively use repeater bandwidth resources.

Another object of the present invention is to provide a method for realizing dynamic adjustment of data bandwidth to dynamically adjust Ethernet data bandwidth and effectively use trunk bandwidth resources, especially, to realize dynamic bandwidth adjustment for Ethernet data in the intelligent integration PCM device in communication domain while ensuring voice services.

The method for realizing dynamic adjustment of Ethernet bandwidth in a PCM device according to the present invention comprises adding a control channel on PCM trunk link to describe time slots occupancy condition in current services (voice, Ethernet data, etc.). Application in peer networking is required for realizing this method in order to realize correct demultiplexing and multiplexing for different services.

The difference between the present invention and traditional PCM voice and data system is to offer a channel distribution mechanism. The mechanism, under control by a CPU, completes dynamic distribution of time slots on a PCM line. It mainly comprises circuit configurations for control word retrieving and insertion, time slot distribution and CPU interface.

Time slot Distributing is controlled by channel control words written in a control channel, and the control channel may comprise one or more time slots; however, one time slot is recommended to save occupancy of the control channel in trunk data bandwidth.

Particularly, the present invention provides a method for realizing dynamic adjustment

of data bandwidth in transmission equipment, in which a control channel is added in trunk link in the transmission equipment to describe time slot occupancy condition.

The control channel completes time slot dynamic distribution for PCM line under the control of CPU.

The time slot dynamic distribution is controlled by channel control words written in the control channel, and the control channel may comprise one or more time slots.

The current services include voice service, Ethernet data service.

The method is applied in peer networking to realize correctly demultiplexing and multiplexing different services.

The present invention also provides a device for realizing dynamic adjustment of data bandwidth in transmission equipment, which comprises: a control word process circuit, a time slot distribution circuit and a CPU interface circuit, wherein the control word process circuit is designed to complete abstraction and insertion of control information in control channel of E1/T1 link; the time slot distribution circuit completes separating voice time slots from Ethernet data time slots, and rebuilding data; CPU interface circuit is for implementing control on time slot distribution.

The device also includes High Level Data link Control (HDLC) / Media Access Control (MAC) frame process circuit to implement processing HDLC link for Ethernet data, checking integrity of MAC frame, comparing and learning MAC addresses.

The time slot dynamic distribution circuit is controlled by channel control words written in the control channel, and the control channel may comprise one or multiple time slots.

The present invention also provide a method for realizing dynamic adjustment of data bandwidth in transmission equipment, characterized that, when a current service is multiplexed to a direction of E1/T1 link, CPU informs time slot distribution circuit of time slot numbers to be occupied by the voice service according to voice call condition, and the time slot distribution circuit releases the time slots from Ethernet data service, and distributes to the voice service; after the voice call finished, CPU informs time slot distribution circuit that the time slot has been released by the voice service, and time slot distribution circuit assigns the time slots to Ethernet data service, thereby dynamic adjustment of Ethernet data

service can be implemented.

The application of the present invention, compared with a prior art, can implement dynamic adjustment of Ethernet data bandwidth while ensuring voice services, and it reaches sufficient and effective usage of E1/T1 trunk bandwidth without error codes and interruption of data service during bandwidth adjustment, so that user's data service bandwidth is enhanced.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a schematic graph of integrated services multiplexed to E1/T1 line;

FIG. 2 shows bit definitions of a control channel; and

FIG. 3 is a hardware schematic diagram of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

In accordance with attached figures, embodiments of the technical solutions will be further described in details as follows:

A hardware portion of the present invention comprises a control word process circuit, a time slot distribution circuit, a High Level Data link Control (HDLC)/ Media Access Control (MAC) frame process circuit and a CPU interface circuit. The control word process circuit implements abstraction and insertion of control information in the control channel of E1 link, and the time slot distribution circuit implements separating voice time slot from Ethernet data time slot and rebuilding Ethernet data, and the HDLC/MAC frame process circuit implements processing HDLC link for Ethernet data, checking integrity of MAC frame, comparing and learning MAC addresses. The CPU interface circuit implements time slot distribution control. Since circuit schematic diagrams in the prevent invention are known to those skilled in the art, and will not be further described here.

A control channel is defined to locate in time slot 1 of E1/T1 link (time slot 0 is used as frame synchronization of link).

Bit definition of the control channel is shown as FIG. 2.

Channel segment number: taking values 0 to 5, representing occupancy information of 30 time slots with a channel bit table with 5 bits.

Channel bit table: representing data occupation condition of a time slot (2-30) with the channel sequence number. "1" expresses that the time slot is occupied by Ethernet data, "0" expresses that the time slot is occupied by the voice service.

According to above definitions, in each E1 frame (125us), it needs to express condition on 30 channels, but, in each E1 frame, time slot 1 can only express 8-bit information, so that it needs multiple E1 frames to express entire channel. A control word is made up of 3-bit time slot segment numbers and 5-bit time slot bit tables. 30 time slots are distributed in 6 time slot segments, and each time slot segment can describe occupancy information of 5 time slots. To describe service distribution condition of 30 time slots demands 6 frames (6×125us=1.5ms), and serial numbers of 6 frames are represented as time slot segment numbers. FIG. 4 lists time slot numbers expressed by control words in 6 frames.

	Time slot bit table					Time slot segment number		
Frame 1	TS2	TS3	TS4	TS5	TS6	0	0	1
Frame 2	TS7	TS8	TS9	TS10	TS11	0	1	0
Frame 3	TS12	TS13	TS14	TS15	TS16	0	1	1
Frame 4	TS17	TS18	TS19	TS20	TS21	1	0	0
Frame 5	TS22	TS23	TS24	TS25	TS26	1	0	1
Frame 6	TS27	TS28	TS29	TS30	TS31	1	1	0

Table 4 Control word configuration

In the present invention the work quantity of software is smaller. In E1/T1 link to the direction of service demultiplexing, demultiplexing service is completely implemented by hardwares without participation of software. When service is multiplexed to the direction of E1/T1 link (called direction of demultiplexing), CPU informs time slot distribution circuit of time slot numbers to be occupied by the voice service according to voice call condition, and

the time slot distribution circuit releases the time slots from Ethernet data at latest 6 frames (1.5 ms) later and assigns to voice service; after the voice call finishes, CPU informs time slot distribution circuit that the circuit time slot has been released by the voice service, and the time slot distribution circuit assigns the time slots to Ethernet data service at latest 6 frames (1.5 ms) later, so as to realize bandwidth dynamic adjustment of Ethernet data service.